

Optimization of the 2D scanning Nano Optic Measuring Machine optical platform

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Abstract: The 2D scanning Nano Optic Measuring Machine being developed at SSRF for the purpose of measuring the surface figure of optical components up to 1.2m in length used at grazing incidence in Synchrotron Radiation beamlines. There are several factors affect the measurement results, such as Act, air turbulence, beam guiding optics and mechanical instability. The optical platform should provide a stable and reliable basis, which determined by the structure, vibration isolation and operating temperature. The design and optimization of the platform are discussed in detail.

1. Optical platform structure design

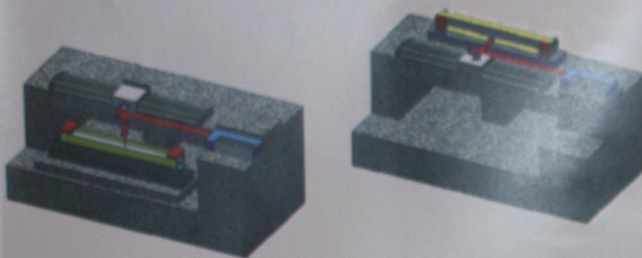


Fig. 1 Two operational modes of the SSRF NOM

2. Optimization of the optical platform structure

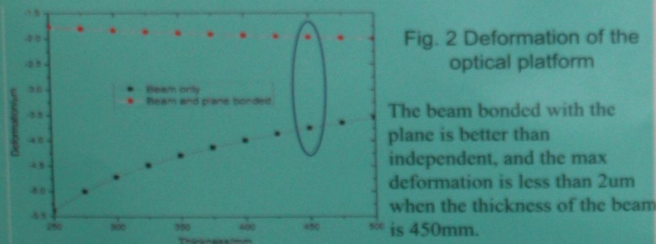


Fig. 2 Deformation of the optical platform

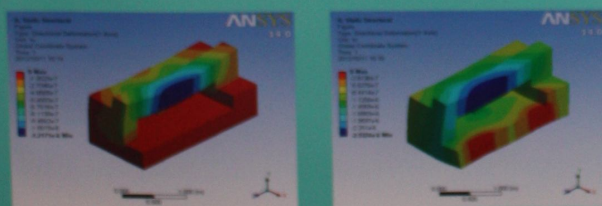


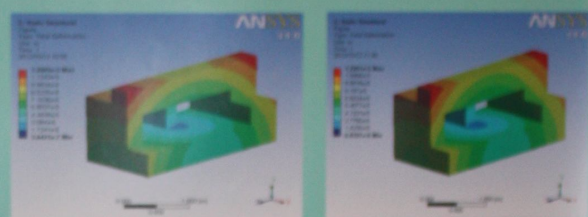
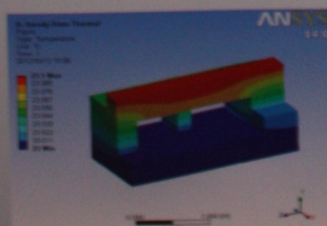
Fig. 3 The deformation of optical platform applied and non-applied air spring.

The max deformation of the optical platform without air spring is smaller used it.

3. Influence of environmental temperature

Fig. 4 Temperature map of the optical platform.

The temperature range of the Constant Temperature Laboratory is 0.1°C. The temperature of the top is 0.1°C higher than the bottom.



a. Without earth gravity load b. Earth gravity load

Fig. 5 Thermal deformation

The deformation considered the earth gravity load is less the not, because the earth gravity inhibited the thermal expansion.

4. Natural frequency of the optical platform and the ground vibration of the Laboratory



Fig. 6 Nature frequency of the optical platform

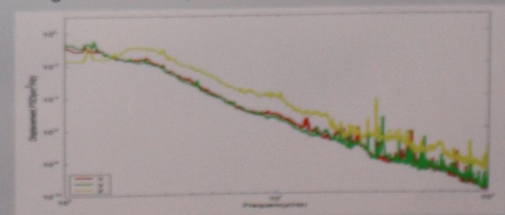


Fig. 7 Ground vibration of the laboratory

The nature frequency of the optical platform is far from characteristic frequency of the ground vibration

Conclusions

1. The beam of the optical platform bonded with the plane, and without air spring is optimal choice.
2. The earth gravity inhibited the thermal expansion, and the thermal deformation is the main negative affect.
3. The nature frequency of the optical platform is far from characteristic frequency of the ground vibration.